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Adverse childhood experiences in eastern Europe

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Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in the European Region

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Abstract

Objective To evaluate the association between adverse childhood experiences – e.g. abuse, neglect, domestic violence and parental separation, substance use, mental illness or incarceration – and the health of young adults in the eastern European Region.

Methods Between 2010 and 2013, adverse childhood experience surveys were undertaken in Albania, Latvia, Lithuania, Montenegro, Romania, the Russian Federation, The former Yugoslav Republic of Macedonia and Turkey. There were 10 696 respondents – 59.7% female – aged 18–25 years. Multivariate modelling was used to investigate the relationships between adverse childhood experiences and health-harming behaviours in early adulthood including substance use, physical inactivity and attempted suicide.

Findings Over half of the respondents reported at least one adverse childhood experience. Having one adverse childhood experience increased the probability of having other adverse childhood experiences. The number of adverse childhood experiences was positively correlated with subsequent reports of health-

harming behaviours. Compared with those who reported no adverse experiences, respondents who reported at least four adverse childhood experiences were at significantly increased risk of many health-harming behaviours, with odds ratios varying from 1.68 (95% confidence interval (CI): 1.32–2.15) – for physical inactivity – to 48.53 (95% CI: 31.98–76.65) – for attempted suicide. Modelling indicated that prevention of adverse childhood experiences would substantially reduce the occurrence of many health-harming behaviours within the study population.

Conclusion Our results indicate that individuals who do not develop health-harming behaviours are more likely to have experienced safe, nurturing childhoods. Evidence-based programmes to improve parenting and support child development need large-scale deployment in the eastern European Region.

Introduction

The United Nations Convention on the Rights of the Child requires all Member States to offer effective child protection.¹ Along with a moral imperative for governments to ensure that children are safe and secure, evidence shows the long-term educational, employment and health benefits that can result from protecting children from maltreatment and facilitating supportive parent–child relationships.^{2–4} Violence has a direct impact on a child’s health through physical and mental injury and, in the most severe cases, death.⁵ However, a child who survives abuse is also at increased risk of developing health-harming and antisocial behaviours during adolescence and noncommunicable conditions, mental illness and disability during adulthood.^{6–8} The magnitude of these effects is substantive. For example, 30% of the adult mental illnesses identified through World Mental Health Surveys in 21 countries were attributed to physical abuse in childhood or other adverse childhood experiences.⁹

Adverse childhood experiences such as abuse and neglect have an immediate impact upon children and are associated with poorer health and behavioural outcomes. Others such as domestic violence affect the environment around children.^{6,7} Various tools have been developed to collect data from adults on their childhood experiences and current health status.^{10–12} Such tools have helped identify relationships between adverse childhood experiences and subsequent sexual risk-taking, substance use and development of health conditions such as obesity, ischaemic heart disease and cancer.^{6–8,13,14}

Globally, a higher incidence of child abuse appears to be found in countries with relatively low per-capita incomes.⁴ In many countries there is limited surveillance of childhood abuse and neglect and often an absence of relevant longitudinal studies. Adverse childhood experience surveys can provide rapid empirical data linking childhood experiences with adult health to inform the economic case for – and development of – appropriate

interventions early in life.⁸ Consequently, several international health organizations have invested in improving and standardizing tools and methods to investigate adverse childhood experiences.^{10–12,15}

A life course approach to health has been made a priority for Europe.¹⁶ A recent meta-analysis of data collected on European children estimated 134 cases of sexual abuse per 1000 girls, 229 cases of physical abuse and 291 cases of emotional abuse per 1000 children.⁴ However, only about one in every three national ministries of health in Europe routinely provides official statistics on child maltreatment.⁴ Within the World Health Organization's (WHO's) European Region, levels of child mortality and morbidity appear to be higher in the east than in the west.⁴ Therefore several countries in eastern Europe have undertaken adverse childhood experience surveys, using standardized methods. Here, we use the combined data from these surveys to measure the association between adverse childhood experiences and health-harming behaviours in young adults and to explore how the relationships between such experiences and behaviours vary between the surveyed countries.

Methods

Health ministries in Albania, Latvia, Lithuania, Montenegro, Romania, the Russian Federation, The former Yugoslav Republic of Macedonia and Turkey (Table 1) undertook adverse childhood experience surveys among young adults (Box 1; available from: <http://www.who.int/bulletin/volumes/92/XX/XX-XXXXXX>). Each survey was coordinated via the relevant national programme lead for violence prevention. The respondents, who were all in secondary or higher education, were not intended to be representative of the young adults in each country. The adverse childhood experience questionnaire was chosen because it produces data on temporally separated events relatively quickly and is a proven method with validated tools.^{10,12} It also avoids some problems associated with prospective studies – e.g. the under-identification of maltreatment in child protection data and confounding from the respondents' maltreatment during the survey process.^{17,18}

Study coordinators recruited respondents through colleges of further education, universities and schools – including vocational schools (Table 1). The family health history questionnaire developed by the United States Centers for Disease Control and Prevention¹⁰ was used to measure childhood adversities and health-harming behaviours. However, outcome variables were sometimes changed by study coordinators, to ensure that the measured risks were pertinent to the target populations (Box 2; available from:

<http://www.who.int/bulletin/volumes/92/XX/XX-XXXXXX>). Following translation of the questionnaire and piloting to assess the questionnaire's validity in each country, the surveys took place in classrooms between May 2010 and April 2013. Sampling used both stratified and random-sample methods, with classes as the sampling unit and each student in attendance asked to complete the questionnaire. Compliance in each country was over 75% (Table 1).

For our multi-study analyses, data were limited to those from the 94.3% (12308/13173) of respondents who were aged 18–25 years (Table 1). Most of the questions on adverse childhood experiences and health-harming behaviours were completed by over 95% of these respondents. However, the questions on sexual abuse were only completed by 91.3% (11236/12308) of respondents. There was between-country variation in the percentages of respondents who answered individual questions. For example; questions about emotional abuse were completed by all of the respondents in Albania and the Russian Federation but only by 89.2% (1339/1501) of the respondents in Montenegro (Table 1). Analysis was limited to respondents that provided information on all 10 adverse childhood experience categories (86.9%, 10696/12308; Table 1). Such respondents had a mean age of 20.1 years and were more likely to be female (59.7%, 6389/10696) than male. Parental educational attainment was used as a proxy for the respondents' socioeconomic status when they were children.¹⁹ This attainment was categorized as high if the parent had graduated from a college of further education or university, middle if the parent had completed secondary or technical school education or had enrolled in – but not completed – a college course and low if the parent had no education, was illiterate, had attended mandatory studies only, had only received an elementary or primary education or had attended a secondary school but had not completed the course. Father's educational attainment was used for the analyses wherever available ($n = 10\,392$). Otherwise, the mother's attainment was used ($n = 224$) or, if neither parent's attainment was known ($n = 80$), the parental attainment was assumed to be middle. The outcomes examined were those that had been measured in at least five of the study countries (Box 2).

Version 18 of PASW Statistics (SPSS Inc., Chicago, United States of America) and version 2.7.9 of StatsDirect (StatsDirect, Altrincham, England) were used for the basic analyses and multinational meta-analysis, respectively. Dependent variables were dichotomized where necessary and relationships between individual adverse childhood experiences were examined using χ^2 analyses. Having any adverse childhood experience was

highly positively associated with having any other adverse childhood experience ($P < 0.001$). Thus, as in previous adverse childhood experience studies,⁶⁻⁸ the number of adverse childhood experience types reported by a respondent – the adverse childhood experience count – was categorized as 0, 1, 2, 3 or greater than 3 (Table 2). To control for independent associations between demographics and differences in outcome results between countries, hierarchical binomial logistic regression was used, with country in the first stratum. A hierarchical model was chosen to account for potential dependencies between individual observations introduced through sampling in different countries.²⁰ The model-derived probabilities of health-harming behaviours associated with demographics and adverse childhood experience counts were used to generate an expected sample prevalence for each health-harming behaviour if all of the respondents' adverse childhood experience counts had been zero. As well as the multinational logistic regression models, models were generated for each outcome in each study country. Using the adjusted odds ratios (aORs) calculated from the country-level models, data were pooled across studies using the summary meta-analysis function in StatsDirect. For Albania and Montenegro there were insufficient individuals with more than three adverse childhood experiences and attempted suicide to generate country level odds ratios. The same was true for drug abuse in the Albania sample. With zero adverse childhood experiences used as the reference category, two statistics – I^2 and Cochran's Q – were used to estimate the between-country heterogeneity in the association between having an adverse childhood experience count above 3 and each of the health-harming behaviours. Forest plots were generated to show the aOR and corresponding 95% confidence interval (CI) for each behaviour – for each study country and for the pooled data. Ethical approval was obtained separately within each study country, using the appropriate processes. Ethical approval for the analysis of combined data from different countries was provided by the Research Ethics Committee of Liverpool John Moores University.

Results

Over half of the respondents reported at least one adverse childhood experience each. The most commonly reported adverse childhood experience was physical abuse (Table 2). In most countries, the reported prevalence of sexual abuse, emotional abuse and having a household member who was incarcerated or used drugs were relatively low. However, sexual abuse was reported by 7.5% (798/10696) of the respondents. The between-country variation in levels of each type of adverse childhood experience was statistically significant ($P < 0.05$). The study

countries also differed in terms of the respondents' demographics (Table 2) and their reported health-harming behaviours (Table 3).

All types of adverse childhood experience were significantly associated with smoking, the problematic use of alcohol and drug abuse (Table 4). Compared with the other respondents, those who had lived with a drug abuser in childhood were much more likely to have used drugs themselves (44.9% [122/272] versus 11.1% [1149/10332]) and those who had lived with a problematic user of alcohol were more likely to report problematic use of alcohol themselves (24.0% [347/1444] versus 6.6% [538/8167]). The proportion of respondents who reported that they had attempted suicide reached 18.5% (166/896) among those who had lived with someone who was depressed or suicidal – compared with just 2.5% (198/7993) among the other respondents. Further, respondents who reported that they were sexually abused as children were much more likely to report that they had had sexual intercourse when aged less than 16 years (31.2% [208/666] versus 11.2% [899/7999]; Table 4).

More than half (53.1%; 6177/11642) of all adverse childhood experiences reported were experienced by the 14.6% (1561/10696) of respondents who each reported at least three adverse childhood experiences. Adverse childhood experience counts were positively correlated with each of the health-harming behaviours (Table 4), even after controlling for country and demographic effects. Compared with the respondents who reported no adverse childhood experiences, those who reported at least four adverse childhood experiences had higher odds for health-harming behaviours; from aOR: 1.68 for physical inactivity to aOR: 48.53 for attempted suicide (Table 5).

We ran separate logistic regression models for each country before using a meta-analysis – and a reference category of a zero adverse childhood experience count – to examine the between-country heterogeneity in the association between an adverse childhood experience count above 3 and health-harming behaviours. Pooled aORs (Fig. 1 and Fig. 2) indicated low between-country heterogeneity ($P > 0.100$) for the relationships between an adverse childhood experience count above 3 and attempted suicide ($I^2 = 34.7\%$), having had five or more sexual partners ($I^2 = 37.2\%$) and physical inactivity ($I^2 = 37.6\%$). Although there was evidence of substantial between-country heterogeneity in the relationship between an adverse childhood experience count above 3 and having had sexual intercourse when aged less than 16 years ($I^2 = 66.8\%$), this was markedly reduced when the outlying data from Albania were excluded ($I^2 = 15.3\%$). Albania was also an outlier for the association between

such an adverse childhood experience count and the problematic use of alcohol and smoking, although substantial between-country heterogeneity in these relationships remained after the Albanian data were excluded – with I^2 values of 57.0% ($P = 0.040$) and 68.1% ($P = 0.005$), respectively. There was evidence of substantial between-country heterogeneity in the association between an adverse childhood experience count above 3 and drug abuse. The level of heterogeneity in this relationship remained substantial even after the outlying data for the Russian Federation were excluded ($I^2 = 67.6\%$; $P = 0.009$). For all of the health-harming behaviours, the random pooled adjusted odds ratios generated in the meta-analysis were consistent with those developed through combined logistic regression (Table 5).

Finally, using the probabilities derived from the logistic regression models (Table 5), we estimated the reduction in levels of each health-harming behaviour if all adverse childhood experiences were eliminated. The percentage of respondents reporting smoking, drug abuse, having at least five sexual partners and having sexual intercourse at an age of less than 16 years would all have been lower – falling from 27.2% (2888/10603) to 21.3% (2258/10603), 12.0% (1271/10604) to 7.7% (817/10604), 14.0% (1186/8498) to 11.1% (943/8498) and 12.8% (1107/8665) to 10.1% (875/8665), respectively. The greatest reductions would be seen in problematic alcohol use and attempted suicide, which would fall from 9.2% (885/9611) to 4.5% (432/9611) and from 4.1% (364/8889) to 0.7% (62/8889) of respondents respectively.

Discussion

Our findings from analyses of adverse childhood experience surveys in eight countries show significant association between adverse childhood experiences and health-harming behaviours of young adults who live in the east of WHO's European Region. The relationship that we observed between the number of adverse childhood experiences and such behaviours are consistent with the results of previous studies.^{6,7} However, such associations have not been previously examined using a multinational sample from the European Region.

While additional studies and meta-analyses are required to confirm and extend our results, it appears that – even in populations with different levels of health-harming behaviours – there are some consistent relationships between such behaviours in young adulthood and adverse childhood experiences. We estimated that if all adverse childhood experience were eliminated, major reductions in health harming behaviours would follow. Although such reductions provide an indication of the extent to which adverse childhood

experiences affect health-harming behaviours, a reduction in the incidence of adverse childhood experiences remains a more realistic objective than their elimination.

In the sample that we investigated, adverse childhood experiences were associated with subsequent health-harming behaviours that were largely independent of the respondent's age, sex and level of parental education. Three out of the seven behaviours that we investigated – smoking, physical inactivity and attempted suicide – had no independent relationship with the level of parental education. However, many of the respondents were recruited while they were in higher education and this may have introduced bias against more disadvantaged groups. More than half of the respondents had at least one parent who had completed secondary or technical school education. Sampling frameworks also varied between countries. For example, the Latvian respondents came from secondary and vocational schools whereas the Turkish respondents came from colleges of further education and universities. Any bias within and between samples may have affected the reported levels of adverse childhood experiences and health-harming behaviours. Although age, sex, parental education and country were included in our multivariate models to account for such variations, further research is required to evaluate levels of each adverse childhood experience and health-harming behaviour – specifically in disadvantaged groups.

One or two countries appeared to differ from the general trend for certain relationships between adverse childhood experiences and health-harming behaviours. For example, Albania appeared to be an outlier for the relationships between adverse childhood experiences and smoking, sexual intercourse when aged less than 16 years and problematic alcohol use. It is unclear if a high incidence of specific adverse childhood experiences – such as domestic violence – in the Albanian sample affected such relationships and this requires further study. Moreover, we are unable to identify if cultural differences between countries (e.g. tolerance of alcohol) may have impacted on reporting (e.g. problematic alcohol use by respondents or by a member of their childhood household). Although the surveys were based on one standardized questionnaire, minor adaptations to that questionnaire in each country and the questionnaire's translation from English into each native language may also have introduced bias. Like other investigations on adverse childhood experiences, this study relied on retrospective recall and consequently may have been affected by recall error. While levels of participation in the surveys and completion of most questions were generally high, relatively large numbers of the respondents failed to answer the questions on sexual abuse and sexual partners. It is not possible to identify if differences in the target groups or

surveyors affected the completion of individual questions and the study's main findings. The percentage of respondents who reported that they had been physically abused in childhood (18.6%; 1993/10696) was similar to an earlier estimate of the prevalence of the physical abuse of European children (22.9%),⁴ which was based on global meta-analyses.^{21–24} Similarly, the percentage of respondents who reported that they had been sexually abused in childhood (7.5%) was similar to the corresponding values – 13.4% for females and 5.7% for males – reported previously.⁴ In contrast, the prevalence of emotional abuse previously recorded (29.1%)⁴ was markedly higher than the corresponding value that we recorded (8.0%; 858/10696), perhaps because of between-study variation in the definition of such abuse.

Worldwide, an estimated 28 000 deaths in children aged 0–14 years were due to homicide in 2010.^{5,25} The actual figure is likely to be substantially higher because of under-reporting and the poor investigation of child deaths in many countries.^{26,27} For every fatal case of child maltreatment, thousands of children suffer non-fatal maltreatment, much of which will go unreported. For example, in England between 2009 and 2010, there were 62 child maltreatment fatalities and 43 700 child maltreatment cases substantiated through child protection data.²⁸ In a different study in the United Kingdom of Great Britain and Northern Ireland, 2.5% of children aged less than 11 years and 6.0% of those aged 11–17 years were found to have experienced physical, sexual or emotional abuse or neglect in the previous year.²⁹ These percentages indicated that child maltreatment was 7- to 17-fold more common than recorded by official reports.²⁹ In the USA, the lifetime economic burden of the new cases of child maltreatment that were identified in the year 2008 – including the costs of childhood health care, child welfare, special education, criminal justice, adult medical costs and productivity losses – was estimated to be approximately 124 billion United States dollars (US\$).³⁰ The corresponding estimated costs per victim were US\$ 210 012 and US\$ 1 272 900 for non-fatal and fatal maltreatment, respectively.³⁰ Although the corresponding costs for our eight study countries are not available, they are likely to be substantive given that abuse, neglect and other stressors in early life so frequently lead to health-harming behaviours and, ultimately, to noncommunicable diseases.^{9,31–33}

A WHO report on preventing child maltreatment in the European Region⁴ argues that child maltreatment and other adverse childhood experiences – and their consequences – could be prevented by interdisciplinary approaches. The high burden of adverse childhood experiences and the potential cost-effectiveness of their prevention make a compelling

argument for increased investment in adverse childhood experience prevention and for mainstreaming such prevention into many areas of health and social policy.⁴ Unfortunately, the routine collection of data on childhood abuse is rare in Europe. Cross-sector work between health, social, education and criminal justice agencies is also rare, typically small-scale and seldom focuses on the primary prevention of adverse childhood experiences. Cost-effective health and social interventions – e.g. home visiting and parent training – can improve childhood environments and reduce antisocial behaviour in later adolescence.^{2–4,34–36} Adverse childhood experience surveys offer a rapid mechanism to encourage investment in such interventions, by identifying the scale of family problems and the potential health and social benefits of addressing such problems. WHO has called on health ministries to take a leadership role and ensure the development of national policies for the prevention of child maltreatment.³⁷

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Competing interests:

None declared.

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Box 1. Adverse childhood experiences during the first 18 years of life: questions and variation in questions by country

Parents separated or divorced

An affirmative response to the question “were your parents ever separated or divorced?” was considered positive for this adverse childhood experience.

Domestic violence towards mother

Based on four questions on domestic violence by father, stepfather or mother’s boyfriend towards mother or stepmother:

- Did he sometimes, often or very often, kick, bite, hit her with a fist or hit her with something hard?
- Did he sometimes, often or very often, push, grab or slap her or throw something at her?
- Did he ever repeatedly hit her for a few minutes or more?
- Did he ever threaten her with a knife or gun?

An affirmative response to any of the questions was considered positive. Respondents in Turkey were asked about domestic violence committed by either parent.

Emotional neglect

Based on four statements:

- There was someone in my family who helped me feel important or special.
- I felt loved.
- People in my family looked out for each other.
- You knew there was someone to take care of you and protect you.

Respondents were asked to score each statement from 1 (very often true) to 5 (never true) and those whose total score exceeded 11 were considered positive for emotional neglect.

Depressed or suicidal household member

An affirmative response to the question “did you live with a household member who was depressed, mentally ill or suicidal?” was considered positive.

Physical abuse

Based on two or four questions:

- Did a household member sometimes, often or very often, push, grab, shove or throw something at you?
- Did a household member ever hit you so hard you had marks or were injured?
- Did a household member ever spank you often or very often, at medium to very hard severity?
- Did a household member spank you sometimes – or a few times a year – quite or very hard?

An affirmative response to any of the questions was considered positive. In Albania, Latvia, Romania and Turkey, only the first two questions were asked.

Emotional abuse

Based on one or two questions:

- Did a parent or household member swear at you, insult you, or put you down often or very often?
- Did a parent or household member sometimes, often or very often, act in a way that made you think that you might be physically hurt?

An affirmative response to either question was considered positive. Only the first of the questions was asked in Turkey

Sexual abuse

Based on four questions:

- Did an adult or someone at least 5 years older than you touch or fondle your body in a sexual way?
- Did an adult or someone at least 5 years older than you have you touch or fondle their body in a sexual way?
- Did an adult or someone at least 5 years older than you attempt to have any type of sex with you?
- Did an adult or someone at least 5 years older than you have any type of sexual intercourse with you?

A respondent who answered yes to any of the questions was considered positive for this adverse experience if they were reporting any sexual experiences that occurred before they were 16 years of age or non-consensual experiences that occurred before they were 18 years of age.

Household member incarcerated

Turkish respondents who answered yes to the question “was anyone in your family imprisoned?” and other respondents who answered yes to the question “did you live with a household member who went to prison?” were considered positive for this adverse childhood experience.

Problematic use of alcohol by household member

A respondent who answered yes to the question “did you live with a household member who was a problem drinker or alcoholic?” was considered positive for this adverse childhood experience.

Drug abuse by household member

Turkish respondents who answered yes to the question “did you share your house with a drug addict?” and other respondents who answered yes to the question “did you live with a household member who used street drugs?” were considered positive for this adverse childhood experience.

Box 2. Outcome variables: questions and variation in questions by country

Smoker

A respondent who answered yes to the question “do you smoke currently?” or, in Turkey, “have you ever been a smoker?” was considered to be a smoker.

Physical inactivity

A respondent who answered zero to the question “during the past month, about how many days per week did you exercise for recreation or to keep in shape?” or, in Latvia, “over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?” was considered to be physically inactive. No data on this topic were collected in Albania and Turkey.

Five or more sexual partners

Respondents were asked “with how many different partners have you ever had sexual intercourse?” No data on this topic were collected in Turkey.

Sexual intercourse at an age of less than 16 years

Respondents were asked “how old were you the first time you had sexual intercourse?” No data on this topic were collected in Turkey.

Drug abuse

A respondent who answered yes to the question “have you ever used street drugs?” or, in Montenegro “have you ever used drugs?” was considered to be a drug abuser.

Problem drinker or alcoholic

A respondent who answered yes to the questions “have you ever had a problem with your use of alcohol?,” “have you ever considered yourself to be an alcoholic?” or, in Turkey, “do you sometimes drink more than is good for you?” was considered to be a problematic user of alcohol. No data on this topic were collected in Latvia.

Attempted suicide

Respondents in all the study countries except Turkey were asked “have you ever attempted to commit suicide?”

Table 1. Survey characteristics, outcome variables and missing data, eastern European Region, 2010–2013

Characteristic	Study country								
	All	Albania	Latvia	Lithuania	Montenegro	Romania	Russian Federation	The former Yugoslav Republic of Macedonia	Turkey
Survey dates		February 2012–March 2012	October 2010–March 2011	May 2010–June 2010	October 2012–December 2012	May 2012–June 2012	June 2012–December 2012	March 2010	June 2012–April 2013
Survey setting		Universities	Secondary and vocational schools	Universities and colleges	Universities	Universities	Secondary schools, vocational academies and universities	Secondary schools and universities	Universities
Sampling		Selected universities stratified by academic year. Random class selection	Locations opportunistic, stratification by school type, study language and gender	Random sample of institutes. Opportunistic sample of students	Universities, sample stratified by faculty and then gender	Sample weighted by regional population, random selection of institutions then students in regions	Random sample of schools. Random selection of institutes then students in regions	Random sample of schools then classrooms. Universities random class selection	Selected universities random sample of faculties and then students
Compliance, %		96	75–100 ^a	75–100 ^a	98	92	86	90	89
Age, years		18–38	17–25	18–39	18–50	14–66	13–41	17–45	18–41
Cities or areas sampled		Tirana, Vlora, Shkodra and Elbasan	Riga, Liepaja, Jelgava, Cesis, Daugavpils	Vilnius, Kaunas, Panevėžys, Šiauliai, Klaipėda	Podgorica, Bar, Budva, Kotor, Igalo, Nikšić, Bijelo Polje	Bucharest, Central, North-East, North-West, West, South-East, South-West region	Moscow, Volgograd, Republic of Tuva, Republic of Buryatia, Khabarovsk	Skopje, Bitola, Tetovo, Struga, Štip, Gostivar	Ankara, Antalya, Izmir, Trabzon, Van
No. of respondents	13 173	1 437	1 223	1 746	1 565	2 088	1 580	1 277	2 257
No. (%) of respondents aged 18–25 years									
No. Surveyed	12 308	1 395	1 190	1 726	1 501	1 655	1 403	1 227	2 211
Missing data – event									
Physical abuse	106 (0.9)	0 (0)	10 (0.8)	30 (1.7)	25 (1.7)	11 (0.7)	0 (0)	4 (0.3)	26 (1.2)
Problematic alcohol use by household member	104 (0.8)	0 (0)	16 (1.3)	15 (0.9)	51 (3.4)	8 (0.5)	0 (0)	4 (0.3)	10 (0.5)
Domestic violence towards mother	133 (1.1)	0 (0)	5 (0.4)	49 (2.8)	33 (2.2)	18 (1.1)	0 (0)	6 (0.5)	22 (1.0)
Parents separated or	89 (0.7)	0 (0)	10 (0.8)	30 (1.7)	24 (1.6)	4 (0.2)	0 (0)	8 (0.7)	13 (0.6)

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divorced									
Emotional neglect	401 (3.3)	0 (0)	23 (1.9)	111 (6.4)	123 (8.2)	30 (1.8)	2 (0.1)	10 (0.8)	104 (4.7)
Depressed or suicidal household member	55 (0.4)	0 (0)	4 (0.3)	19 (1.1)	22 (1.5)	4 (0.2)	0 (0)	2 (0.2)	4 (0.2)
Emotional abuse	262 (2.1)	0 (0)	8 (0.7)	48 (2.8)	162 (10.8)	10 (0.6)	0 (0)	11 (0.9)	23 (1.0)
Sexual abuse	1 072 (8.7)	0 (0)	140 (11.8)	255 (14.8)	248 (16.5)	86 (5.2)	0 (0)	17 (1.4)	326 (14.7)
Household member incarcerated	74 (0.6)	0 (0)	7 (0.6)	23 (1.3)	27 (1.8)	5 (0.3)	0 (0)	4 (0.3)	8 (0.4)
Drug abuse by household member	129 (1.0)	0 (0)	20 (1.7)	25 (1.4)	67 (4.5)	5 (0.3)	0 (0)	5 (0.4)	7 (0.3)
Answering all ACE questions	10 696 (86.9)	1 395 (100.0)	1 003 (84.3)	1 361 (78.9)	1 046 (69.7)	1 527 (92.3)	1 401 (99.9)	1 200 (97.8)	1 763 (79.7)
Missing data – behaviour									
Smoker	93 (0.9)	0 (0)	8 (0.8)	36 (2.6)	17 (1.6)	26 (1.7)	0 (0)	1 (0.1)	5 (0.3)
Physical inactivity	57 (0.5)	NA	43 (4.3)	2 (0.1)	4 (0.4)	8 (0.5)	0 (0)	0 (0.0)	NA
Five or more sexual partners	435 (4.1)	0 (0)	132 (13.2)	114 (8.4)	101 (9.7)	81 (5.3)	0 (0)	7 (0.6)	NA
Sexual intercourse at age of less than 16 years	268 (2.5)	3 (0.2)	77 (7.7)	84 (6.2)	58 (5.5)	44 (2.9)	1 (0.1)	1 (0.1)	NA
Drug abuse	92 (0.9)	0 (0)	2 (0.2)	2 (0.1)	9 (0.9)	9 (0.6)	0 (0)	2 (0.2)	68 (3.9)
Problematic use of alcohol	82 (0.8)	0 (0)	NA	0 (0.0)	8 (0.8)	7 (0.5)	0 (0)	0 (0.0)	67 (3.8)
Attempted suicide	44 (0.4)	0 (0)	7 (0.7)	17 (1.2)	5 (0.5)	15 (1.0)	0 (0)	0 (0.0)	NA

ACE: advanced childhood experience; NA: not available.

^a Range provided by national coordinators.

Table 2. **Sample demographics and proportions with adverse childhood experiences by country, eastern European Region, 2010–2013**

Characteristic	Study country								
	All <i>n</i> = 10 696	Albania <i>n</i> = 1 395	Latvia <i>n</i> = 1 003	Lithuania <i>n</i> = 1 361	Montenegro <i>n</i> = 1 046	Romania <i>n</i> = 1 527	Russian Federation <i>n</i> = 1 401	The former Yugoslav Republic of Macedonia <i>n</i> = 1 200	Turkey <i>n</i> = 1 763
Sex, No. (%)									
Female	6 389 (59.7)	943 (67.6)	511 (50.9)	922 (67.7)	545 (52.1)	957 (62.7)	840 (60.0)	718 (59.8)	953 (54.1)
Male	4 307 (40.3)	452 (32.4)	492 (49.1)	439 (32.3)	501 (47.9)	570 (37.3)	561 (40.0)	482 (40.2)	810 (45.9)
Age group, No. (%)									
18–19 years	4 480 (41.9)	304 (21.8)	906 (90.3)	477 (35.0)	593 (56.7)	228 (14.9)	459 (32.8)	720 (60.0)	793 (45.0)
20–21 years	4 237 (39.6)	608 (43.6)	77 (7.7)	820 (60.2)	379 (36.2)	734 (48.1)	554 (39.5)	344 (28.7)	721 (40.9)
22–25 years	1 979 (18.5)	483 (34.6)	20 (2.0)	64 (4.7)	74 (7.1)	565 (37.0)	388 (27.7)	136 (11.3)	249 (14.1)
Level of parental education, No. (%)									
Low	1 295 (12.1)	187 (13.4)	56 (5.6)	30 (2.2)	46 (4.4)	139 (9.1)	181 (12.9)	115 (9.6)	541 (30.7)
Medium	5 658 (52.9)	714 (51.2)	601 (59.9)	689 (50.6)	672 (64.2)	929 (60.8)	711 (50.7)	747 (62.2)	595 (33.7)
High	3 743 (35.0)	494 (35.4)	346 (34.5)	642 (47.2)	328 (31.4)	459 (30.1)	509 (36.3)	338 (28.2)	627 (35.6)
Events reported, No. (%)^a									
Physical abuse	1 993 (18.6)	572 (41.0)	162 (16.2)	176 (12.9)	205 (19.6)	357 (23.4)	180 (12.8)	83 (6.9)	258 (14.6)
Problematic use of alcohol by household member	1 753 (16.4)	289 (20.7)	304 (30.3)	357 (26.2)	114 (10.9)	341 (22.3)	128 (9.1)	108 (9.0)	112 (6.4)
Domestic violence towards mother	1 563 (14.6)	419 (30.0)	204 (20.3)	225 (16.5)	96 (9.2)	103 (6.7)	183 (13.1)	17 (1.4)	316 (17.9)
Parents separated or divorced	1 508 (14.1)	92 (6.6)	424 (42.3)	270 (19.8)	99 (9.5)	250 (16.4)	235 (16.8)	45 (3.8)	93 (5.3)
Emotional neglect	1 257 (11.8)	227 (16.3)	89 (8.9)	137 (10.1)	77 (7.4)	116 (7.6)	258 (18.4)	200 (16.7)	153 (8.7)
Depressed or suicidal household member	1 069 (10.0)	106 (7.6)	189 (18.8)	140 (10.3)	59 (5.6)	211 (13.8)	115 (8.2)	82 (6.8)	167 (9.5)
Emotional abuse	858 (8.0)	370 (26.5)	79 (7.9)	59 (4.3)	49 (4.7)	136 (8.9)	40 (2.9)	59 (4.9)	66 (3.7)
Sexual abuse	798 (7.5)	266 (19.1)	70 (7.0)	47 (3.5)	38 (3.6)	89 (5.8)	78 (5.6)	89 (7.4)	121 (6.9)
Household member incarcerated	567 (5.3)	52 (3.7)	83 (8.3)	48 (3.5)	75 (7.2)	35 (2.3)	77 (5.5)	50 (4.2)	147 (8.3)

Drug abuse by household member	276 (2.6)	21 (1.5)	48 (4.8)	20 (1.5)	32 (3.1)	36 (2.4)	20 (1.4)	43 (3.6)	56 (3.2)
Event count per respondent, No. (%)									
0	5 068 (47.4)	422 (30.3)	281 (28.0)	644 (47.3)	593 (56.7)	709 (46.4)	699 (49.9)	721 (60.1)	999 (56.7)
1	2 669 (25.0)	317 (22.7)	288 (28.7)	335 (24.6)	251 (24.0)	400 (26.2)	389 (27.8)	299 (24.9)	390 (22.1)
2	1 398 (13.1)	236 (16.9)	187 (18.6)	195 (14.3)	114 (10.9)	202 (13.2)	162 (11.6)	109 (9.1)	193 (10.9)
3	771 (7.2)	227 (16.3)	106 (10.6)	87 (6.4)	41 (3.9)	99 (6.5)	75 (5.4)	43 (3.6)	93 (5.3)
> 3	790 (7.4)	193 (13.8)	141 (14.1)	100 (7.3)	47 (4.5)	117 (7.7)	76 (5.4)	28 (2.3)	88 (5.0)

^a The reported proportions of adverse childhood experiences should not be compared directly because the sampling process differed between countries.

Table 3. Percentage of respondents^a reporting health-harming behaviours by country, eastern European Region, 2010–2013

Behaviour	Study Country								
	Overall % (No. HHB/ <i>n</i>)	Albania % (No. HHB/ <i>n</i>)	Latvia % (No. HHB/ <i>n</i>)	Lithuania % (No. HHB/ <i>n</i>)	Montenegro % (No. HHB/ <i>n</i>)	Romania % (No. HHB/ <i>n</i>)	Russian Federation % (No. HHB/ <i>n</i>)	The former Yugoslav Republic of Macedonia % (No. HHB/ <i>n</i>)	Turkey % (No. HHB/ <i>n</i>)
Smoker	27.2 (2 888/10 603)	22.0 (307/1 395)	40.5 (403/995)	32.5 (431/1 325)	16.3 (168/1 029)	32.9 (494/1 501)	21.2 (297/1 401)	26.9 (323/1 199)	26.5 (465/1 758)
Physical inactivity	17.0 (1 274/7 481)	NA	5.5 (53/960)	17.0 (231/1 359)	26.7 (278/1 042)	20.6 (313/1 519)	16.1 (225/1 401)	14.5 (174/1 200)	NA
Five or more sexual partners	14.0 (1 186/8 498)	9.2 (129/1 395)	16.2 (141/871)	11.1 (138/1 247)	16.7 (158/945)	20.9 (302/1 446)	15.5 (217/1 401)	8.5 (101/1 193)	NA
Sexual intercourse when aged < 16 years	12.8 (1 107/8 665)	13.3 (185/1 392)	21.9 (203/926)	5.5 (70/1 277)	9.8 (97/988)	12.1 (180/1 483)	19.5 (273/1 400)	8.3 (99/1 199)	NA
Drug abuse	12.0 (1 271/10 604)	4.1 (57/1 395)	27.7 (277/1 001)	29.2 (397/1 359)	10.5 (109/1 037)	15.2 (230/1 518)	4.8 (67/1 401)	5.4 (65/1 198)	4.1 (69/1 695)
Problematic use of alcohol	9.2 (885/9 611)	12.0 (168/1 395)	NA	9.0 (123/1 361)	8.5 (88/1 038)	7.2 (109/1 520)	10.5 (147/1 401)	6.5 (78/1 200)	10.1 (172/1 696)
Attempted suicide	4.1 (364/8 889)	3.6 (50/1 395)	6.3 (63/996)	4.6 (62/1 344)	2.7 (28/1 041)	4.4 (66/1 512)	4.2 (59/1 401)	3.0 (36/1 200)	NA

HHB: health harming behaviour; NA: not available.

^a The percentage of respondents reporting health-harming behaviours should not be compared directly because the sampling process differed between countries.

Table 4. Proportions reporting each health-harming behaviour by exposure to individual adverse childhood experiences, eastern European Region, 2010–2013

Adverse childhood experience	Health-harming behaviour													
	Smoker (<i>n</i> = 10 603)		Physical inactivity (<i>n</i> = 7 481) ^a		At least five sexual partners (<i>n</i> = 8 498) ^a		Sexual intercourse when aged < 16 years (<i>n</i> = 8 665) ^b		Drug abuse (<i>n</i> = 10 604)		Problematic use of alcohol (<i>n</i> = 9 611) ^c		Attempted suicide (<i>n</i> = 8 889) ^d	
	% (No. HHB / No. ACE)	<i>P</i>	% (No. HHB / No. ACE)	<i>P</i>	% (No. HHB / No. ACE)	<i>P</i>	% (No. HHB / No. ACE)	<i>P</i>	% (No. HHB / No. ACE)	<i>P</i>	% (No. HHB / No. ACE)	<i>P</i>	% (No. HHB / No. ACE)	<i>P</i>
Physical abuse														
No	25.5 (2 201/8 619)		16.4 (1 035/6 328)		12.5 (850/6 825)		11.6 (810/6 968)		10.7 (926/8 626)		7.5 (584/7 794)		2.6 (183/7 163)	
Yes	34.6 (687/1 984)	< 0.001	20.7 (239/1 153)	< 0.001	20.1 (336/1 673)	< 0.001	17.5 (297/1 697)	< 0.001	17.4 (345/1 978)	< 0.001	16.6 (301/1 817)	< 0.001	10.5 (181/1 726)	< 0.001
Problematic use of alcohol by household member														
No	25.1 (2 222/8 867)		16.4 (1 010/6 150)		13.6 (940/6 934)		12.5 (887/7 072)		9.9 (876/8 860)		6.6 (538/8 167)		2.6 (192/7 262)	
Yes	38.4 (666/1 736)	< 0.001	19.8 (264/1 331)	< 0.01	15.7 (246/1 564)	< 0.05	13.8 (220/1 593)	NS	22.6 (395/1 744)	< 0.001	24.0 (347/1 444)	< 0.001	10.6 (172/1 627)	< 0.001
Domestic violence towards mother														
No	26.4 (2 390/9 046)		16.6 (1 103/6 661)		13.7 (1 004/7 306)		12.2 (911/7 448)		11.4 (1 032/9 061)		8.1 (671/8 267)		3.0 (227/7 648)	
Yes	32.0 (498/1 557)	< 0.001	20.9 (171/820)	< 0.01	15.3 (182/1 192)	NS	16.1 (196/1 217)	< 0.001	15.5 (239/1 543)	< 0.001	15.9 (214/1 344)	< 0.001	11.0 (137/1 241)	< 0.001
Parents separated or divorced														
No	25.1 (2 290/9 110)		16.8 (1 036/6 176)		12.9 (920/7 159)		11.7 (856/7 295)		9.8 (895/9 103)		8.3 (712/8 533)		2.8 (211/7 485)	
Yes	40.1 (598/1 493)	< 0.001	18.2 (238/1 305)	NS	19.9 (266/1 339)	< 0.001	18.3 (251/1 370)	< 0.001	25.0 (376/1 501)	< 0.001	16.0 (173/1 078)	< 0.001	10.9 (153/1 404)	< 0.001
Emotional neglect														
No	26.5 (2 478/9 358)		16.7 (1 105/6 611)		13.2 (983/7 447)		12.2 (923/7 592)		11.6 (1 088/9 359)		8.3 (703/8 454)		3.2 (246/7 792)	
Yes	32.9 (410/1245)	< 0.001	19.4 (169/870)	< 0.05	19.3 (203/1 051)	< 0.001	17.1 (184/1 073)	< 0.001	14.7 (183/1 245)	< 0.01	15.7 (182/1 157)	< 0.001	10.8 (118/1 097)	< 0.001
Depressed or suicidal household member														

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No	26.0 (2 485/9 546)		16.5 (1 102/6 693)		13.8 (1 053/7 633)		12.5 (975/7 787)		10.7 (1 020/9 548)		8.0 (699/8 738)		2.5 (198/7 993)	
Yes	38.1 (403/1 057)	<0.001	21.8 (172/788)	<0.001	15.4 (133/865)	NS	15.0 (132/878)	<0.05	23.8 (251/1 056)	<0.001	21.3 (186/873)	<0.001	18.5 (166/896)	<0.001
Emotional abuse														
No	26.3 (2 561/9 747)		16.7 (1 181/7 063)		13.3 (1 025/7 728)		12.0 (944/7 885)		11.6 (1 127/9 751)		8.2 (726/8 836)		2.9 (238/8 102)	
Yes	38.2 (327/856)	<0.001	22.2 (93/418)	<0.01	20.9 (161/770)	<0.001	20.8 (162/780)	<0.001	16.9 (144/853)	<0.001	20.5 (159/775)	<0.001	16.0 (126/787)	<0.001
Sexual abuse														
No	26.4 (2 593/9 808)		17.1 (1 209/7 071)		13.2 (1 039/7 842)		11.2 (899/7 999)		11.6 (1 143/9 818)		8.3 (742/8 895)		3.4 (277/8 214)	
Yes	37.1 (295/795)	<0.001	15.9 (65/410)	NS	22.4 (147/656)	<0.001	31.2 (208/666)	<0.001	16.3 (128/786)	<0.001	20.0 (143/716)	<0.001	12.9 (87/675)	<0.001
Household member incarcerated														
No	26.7 (2 685/10 039)		17.0 (1 211/7 115)		13.8 (1 115/8 107)		12.5 (1 032/8 258)		11.5 (1 156/10 045)		8.7 (792/9 133)		3.2 (268/8 473)	
Yes	36.0 (203/564)	<0.001	17.2 (63/366)	NS	18.2 (71/391)	<0.05	18.4 (75/407)	<0.001	20.6 (115/559)	<0.001	19.5 (93/478)	<0.001	23.1 (96/416)	<0.001
Drug abuse by household member														
No	26.6 (2 745/10 327)		17.0 (1 240/7 283)		13.6 (1 129/8 291)		12.4 (1 052/8 451)		11.1 (1 149/10 332)		8.7 (816/9 388)		3.6 (314/8 670)	
Yes	51.8 (143/276)	<0.001	17.2 (34/198)	NS	27.5 (57/207)	<0.001	25.7 (55/214)	<0.001	44.9 (122/272)	<0.001	30.9 (69/223)	<0.001	22.8 (50/219)	<0.001
No. of ACE reported by respondent														
0	21.1 (1 059/5 017)		16.0 (579/3 625)		10.5 (406/3 865)		9.6 (377/3 934)		7.4 (373/5 027)		4.6 (216/4 747)		0.7 (30/4 051)	
1	29.1 (770/2 647)		16.5 (322/1 949)		15.8 (341/2 159)		12.9 (284/2 210)		12.6 (332/2 645)		9.2 (217/2 360)		2.2 (49/2 268)	
2	30.4 (422/1 386)		17.9 (172/959)		15.2 (174/1 147)		14.8 (173/1 167)		16.5 (228/1 384)		13.8 (165/1 200)		5.2 (62/1 199)	
3	38.4 (295/768)		20.7 (92/445)		16.8 (110/656)		18.0 (121/671)		16.2 (124/765)		15.6 (103/661)		8.7 (59/675)	
> 3	43.6 (342/785)	<0.001	21.7 (109/503)	<0.01	23.1 (155/671)	<0.001	22.3 (152/683)	<0.001	27.3 (214/783)	<0.001	28.6 (184/643)	<0.001	23.6 (164/696)	<0.001

ACE: advanced childhood experience; HHB: health harming behaviour; NS: not significant.

^a Excludes Turkey and Albania because the relevant data were not collected for these countries.

^b Excludes Turkey because the relevant data were not collected for this country.

^c Excludes Latvia because the relevant data were not collected for this country.

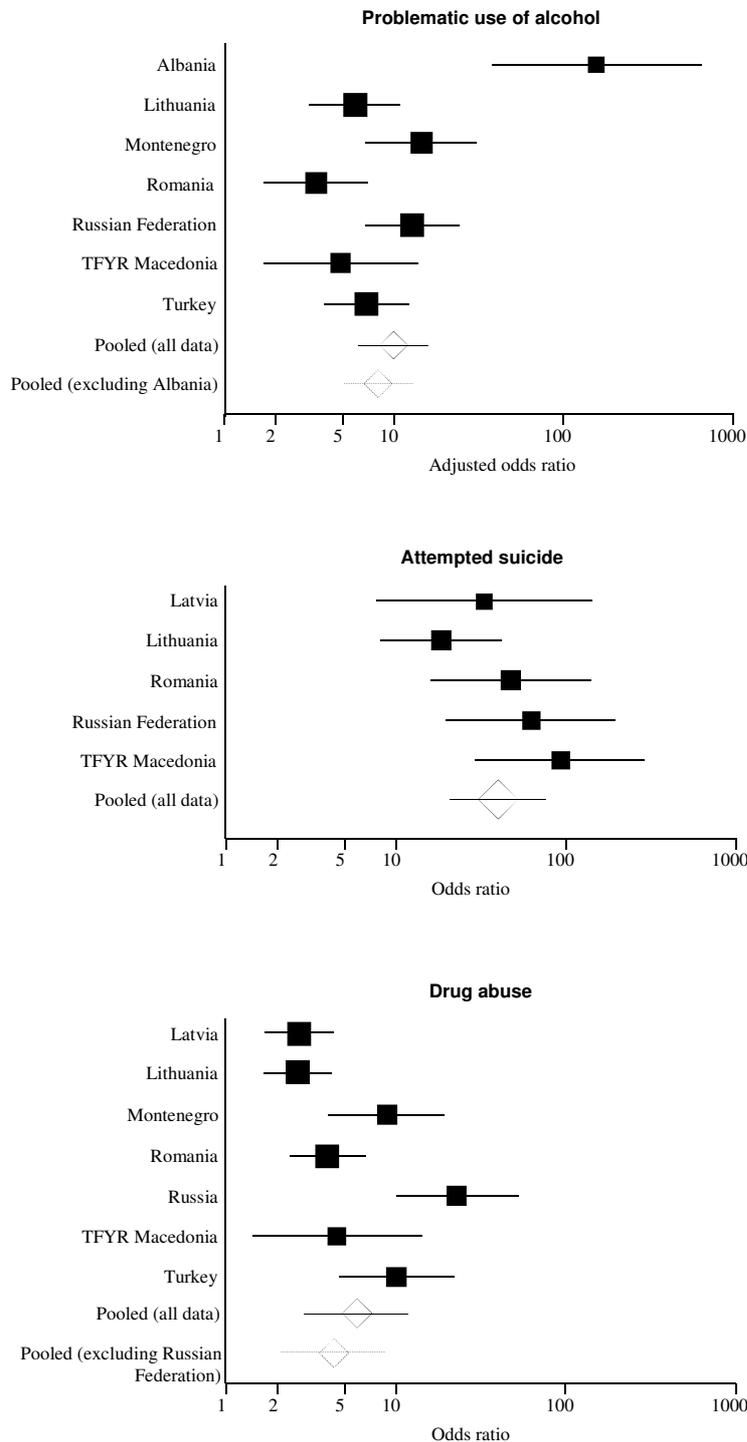
Table 5. Demographics and number of adverse childhood experiences as predictors of health-harming behaviours, eastern European Region, 2010–2013

Variable	Adjusted odds ratio (95% CI) ^a						
	Smoker	Physical inactivity	At least five sexual partners	Sexual intercourse when aged < 16 years	Drug abuse	Problematic use of alcohol	Attempted suicide
Sex							
Female	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Male	1.71 (1.56–1.87)	0.42 (0.36–0.48)	5.99 (5.19–6.92)	4.02 (3.50–4.62)	2.54 (2.23–2.90)	1.93 (1.67–2.23)	0.30 (0.22–0.40)
Age, years							
18–19	1.0	1.0	1.0	1.0	1.0	1.0	1.0
20–21	1.07 (0.97–1.19)	1.12 (0.96–1.30)	1.71 (1.44–2.03)	1.04 (0.88–1.23)	1.44 (1.23–1.70)	1.16 (0.98–1.37)	1.01 (0.76–1.34)
22–25	0.99 (0.86–1.13)	1.46 (1.21–1.77)	2.16 (1.77–2.64)	0.87 (0.71–1.06)	1.55 (1.25–1.92)	1.16 (0.94–1.42)	1.11 (0.79–1.58)
Level of parental education							
Low	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Medium	1.01 (0.87–1.17)	0.92 (0.73–1.16)	0.91 (0.72–1.16)	1.01 (0.80–1.28)	1.26 (0.97–1.64)	1.11 (0.88–1.41)	0.87 (0.60–1.24)
High	1.09 (0.94–1.28)	0.86 (0.67–1.11)	1.24 (0.97–1.60)	1.25 (0.98–1.60)	1.97 (1.51–2.57)	1.68 (1.32–2.13)	0.91 (0.61–1.34)
ACE count							
0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1	1.48 (1.33–1.65)	1.19(1.02–1.39)	1.53 (1.30–1.80)	1.25 (1.05–1.48)	1.70 (1.44–2.00)	2.11 (1.73–2.57)	3.30 (2.08–5.23)
2	1.63 (1.42–1.87)	1.28 (1.05–1.55)	1.74 (1.42–2.14)	1.72 (1.40–2.10)	2.54 (2.09–3.07)	3.55 (2.86–4.42)	7.96 (5.09–12.45)
3	2.48 (2.09–2.93)	1.60 (1.24–2.07)	2.26 (1.75–2.91)	2.19 (1.72–2.79)	2.98 (2.34–3.79)	4.21 (3.25–5.46)	15.50(9.79–24.55)
> 3	3.03 (2.57–3.57)	1.68 (1.32–2.15)	3.67 (2.90–4.64)	3.14 (2.50–3.95)	5.71 (4.61–7.08)	9.74(7.74–12.26)	48.53 (31.98–76.65)

ACE: adverse childhood experience; CI: confidence interval.

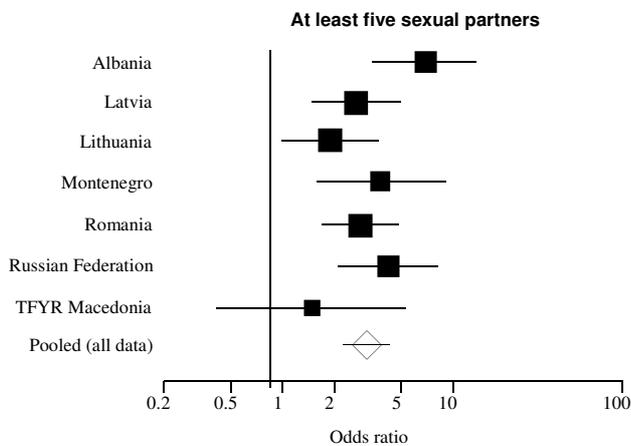
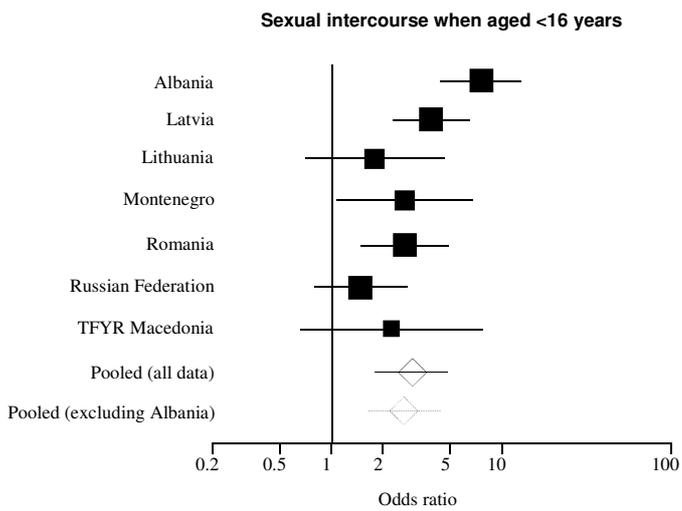
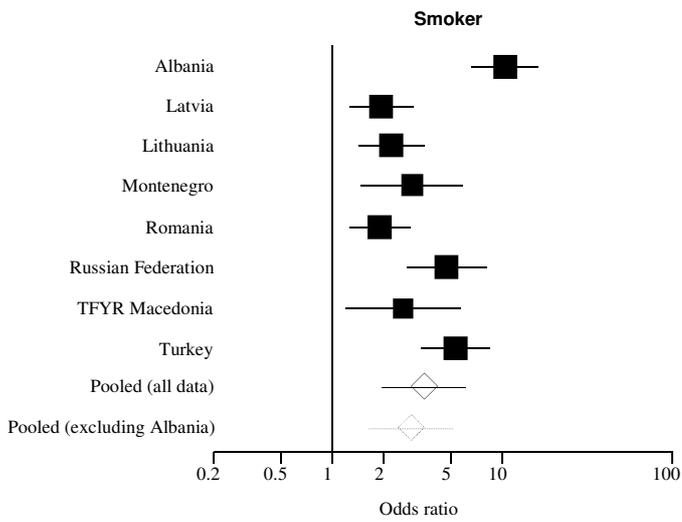
^a Country of survey was included in the first stratum of the hierarchical binomial logistic regression model. Country effects were significant for all of the health-harming behaviours investigated.

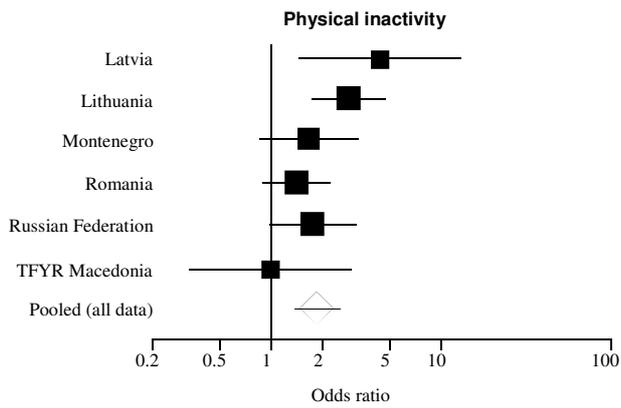
Fig. 1. Country-specific likelihood of health-harming behaviours in young adults with at least four adverse childhood experience, eastern European Region, 2010–2013



Notes: Adjusted odds ratios were calculated for respondents who reported at least four adverse childhood experiences each. Respondents who reported no such experiences were used as the reference category. In these forest plots, the horizontal lines indicate 95% confidence intervals and the area of each black square is proportional to the corresponding study's weight in the meta-analysis. We used binomial logistic regression model with each health harming behaviour as the dependent and categorized counts of adverse childhood experiences and demographics (age, gender, and parental education level) as independent variables. High odds ratios were generated when particular health harming behaviours were rare in those with no adverse childhood experiences but relatively frequent in those with four or more adverse childhood experiences.

Fig. 2. Country-specific likelihood of health-harming behaviours in young adults with at least four adverse childhood experience, eastern European Region, 2010–2013





Note: Adjusted odds ratios were calculated for respondents who reported at least four adverse childhood experiences each. Respondents who reported no such experiences were used as the reference category. In these forest plots, the horizontal lines indicate 95% confidence intervals and the area of each black square is proportional to the corresponding study's weight in the meta-analysis.